Assessment of phosphorus fertilizing practices in altered wetland soils using uncertainty analysis

M. Iggy Litaor[1], I. Chash[1], I. Barnea[1], M. Shenker[2]

[1] Tel Hai College, Dept. of Environ. Sci. Upper Galilee, 12210 Israel, [2] The Hebrew University of Jerusalem, P.O. Box 12, Rehovot 76100, Israel
litaori@telhai.ac.il

Intensive P fertilization has been widely applied in altered wetland soils even when soil-test P indicates sufficiency (Olsen-P>10 mg kg^{-1}). Reexamination of this practice using 48 lysimeters (1.5 m^3), three soil types, two fertilizers (Superphosphate and P-rich biochar), two application rates, and typical crop rotation, have shown no yield response to the fertilizers. Hence, we recommended reduction in the use of P fertilizers in these soils. The finding of the lysimeter study was further assessed using sequential Guassian simulation approach. First, we sampled 90 soil locals with unique georeferencing to generate a robust cumulative conditional distribution function. The locations of the sampled soils were determined according to their parent material (deep peat, shallow peat, marl) and the practiced crop rotation. The soils were analyzed for their Olsen-P content, bulk density, pH, electrical conductance, and the concentrations of nitrate, chloride and sulfate in the saturated paste extracts. Next, we conducted a variogram analysis after transforming the data with normal score routine. The 'best' spatial structure of the Olsen-P distribution with estimated local accuracy was conducted with ordinary kriging. We used the simulation model to produce 100 alternative realizations as a measure of the joint spatial uncertainty of the P concentrations in the study area (~ 1500 ha). Finally, we post processed the simulation results after back transforming the data to compute the probability of exceeding the threshold value of 10 mg Olsen-P kg^{-1}. This simulation approach provides a robust quantitative mean for planning the reduction of P fertilization across farm lands.